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Farmers' Bulletin 1065
United States Department of Agriculture

The Flat-Headed Apple-Tree Borer

THE flat-headed apple-tree borer, a serious orchard pest throughout the greater part of the United States, is found from the Atlantic to the Pacific and from Florida and Texas to Canada.

The larva, or grub, of this insect (which in the adult stage is a medium-sized beetle) bores in the bark and wood of a great variety of trees, but is best known as an enemy of apple, pear, peach, and other cultivated fruit trees. Its depredations are felt in almost every locality where orchards have been planted.

Fortunately, this borer almost invariably confines its attacks to the sunny sides of trees that have been weakened or injured by some other agency. Any system of orchard culture and care that will produce sound, upright, vigorous trees is the best practice for preventing loss from this borer.

The orchardist may take advantage of the beetle's preference while engaged in egg laying for warm sunlight. Low-formed branches on the south side of trees and boards set in the ground so as to throw a shadow on the trunks of newly planted trees will cause the beetles to seek for sunnier places in which to leave their eggs. This and other methods of control are described on pages 10 to 12.

Contribution from the Bureau of Entomology
L. O. HOWARD, Chief
Washington, D. C. October, 1919

THE FLAT-HEADED APPLE-TREE BORER.[1]

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A WIDELY KNOWN ORCHARD PEST.

OF the several kinds of wood and bark boring insects which attack fruit trees in the United States, the flat-headed apple-tree borer is one of the most widely known. The adult form is a medium-sized beetle (fig. 5), native to American forests, which has attacked cultivated fruit trees since the pioneer days of orcharding in this country. It is now known to occur in nearly every State of the Union and also in southern Canada. Throughout this region it injures every year a great variety of fruit trees, as well as many kinds of shade and forest trees.

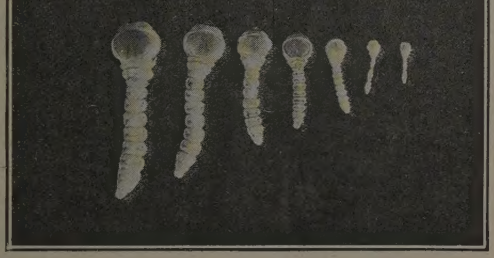

FIG. 1.—Flat-headed apple-tree borers of various sizes to be found in infested trees at almost any season of the year. Natural size.

Trees of almost any size after they are one or two years old may be attacked, but, as a rule, injury is confined to those that have already been weakened by some other agency, or that are abnormal either in their position or in general health. Trees that are newly transplanted (fig. 2), that have assumed a leaning

[1] *Chrysobothris femorata* Fab.; order Coleoptera, family Buprestidae.

position (fig. 3), that are deficient in vigor from starving or overbearing, that have been subjected to injury of the trunk or branches by sun-scald or other diseases or weather conditions, or that have suffered injury from tools, rodents, or insects, invite attack by this insect. On the other hand, trees that are normally vigorous, upright in growth, and have sound, healthy bark, very rarely, if ever, are injured by this flat-headed borer.

FIG. 2.—Apple tree first year after transplanting, girdled and killed by flat-headed apple-tree borers.

LOCATION AND NATURE OF INJURY.

Injury to trees is done by this insect only while it is in the larva or grub stage (fig. 1), and the species receives its common name from the fact that the grub is flat-headed. The grubs or borers enter the bark of the trunk or larger branches and feed between the bark and sapwood until about full grown. They then usually burrow a short distance into the wood, where they pass the winter (fig. 11), and, in the spring following, change to the pupa, or resting stage (fig. 12), and a little later into beetles. The burrows in the bark and sapwood are broad and irregular in shape, the form depending very much upon the size of the tree and the thickness of the bark (figs. 4, 6).

In old trees most of the feeding is done in the thick inner bark, and the wound made is often more or less circular in outline. In young trees the feeding is mostly from the sapwood, and the wound is likely to be more elongate, often encircling the tree and killing it (fig. 2).

The borer while feeding keeps a clear space around itself to allow of free movement, but packs the excavation behind with a compact mass of digested wood particles (fig. 9). In large trees injury almost invariably is confined to the sunny side (fig. 3). In such a place a wound that was small in the beginning may be enlarged year after year by succeeding generations of the borers working around the borders of the wound at the point where the live and dead tissues of the tree meet (fig. 4).

Scarcely any castings are thrown out, and the place where borers are at work is not always clearly marked on the surface of the bark. Injured spots, however, usually can be detected from the outside by the darker color and slight depression of the bark and often by cracks which form in the bark, through which the frass (excrement) shows. Usually, where an area on the trunk of a tree is killed by borers, a strip of dying wood soon extends some distance above it, and this strip is in turn attacked and enlarged by the borers.

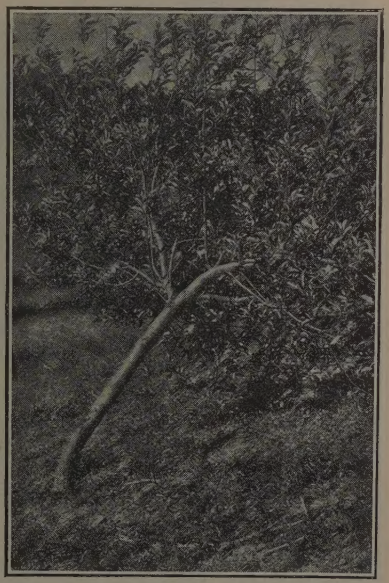

FIG. 3.—Leaning apple tree with trunk exposed to direct rays of the sun. Flat-headed borers may always be looked for in such trees.

FOOD PLANTS.

The following trees and shrubs are known to be attacked by the flat-headed apple-tree borer: Apple, pear, peach, apricot, plum, prune, cherry, quince, currant, walnut, pecan, hickory, Carolina poplar, willow, weeping willow, beech, chestnut, oak, elm, hackberry, sycamore, mountain ash, service berry, hawthorn, redbud, sugar maple, soft maple, horse-chestnut, linden, Japanese persimmon, and box elder. Where orchards are planted adjacent to woodlands, the beetles often come from the forest trees and deposit eggs in the fruit trees before they have recovered from the shock of transplanting. The borers hatching from the eggs deposited on the newly-set trees find the devitalized bark and wood exactly to their liking, and often girdle and kill many of the trees (fig. 2). After the trees have had

one season's growth, they are usually safe from attack so long as they are kept in a vigorous condition.

APPEARANCE AND HABITS OF THE INSECT.

THE ADULT.

The adult of the flat-headed apple-tree borer (fig. 5) is a broad, flat beetle, averaging about half an inch in length by less than one-fourth of an inch in width, though individuals differ considerably in size. It tapers from the center toward both ends. The color of the back is dark brown, indistinctly marked with spots and irregular bands of dull gray, the whole, when viewed under certain conditions of light, having a slight brassy sheen. The underparts of the body are bronze, and the back beneath the wings is brilliant metallic greenish blue. In flight the beetles produce a musical buzzing sound not unlike the humming of a bee.

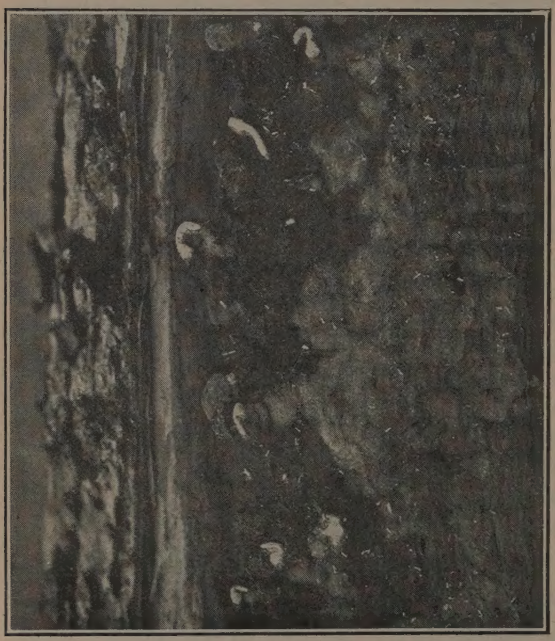

FIG. 4.—Young flat-headed apple-tree borers working outward into live wood from a dead area on the trunk of an apple tree. Natural size.

The beetles issue from the wood (fig. 6) soon after the blooming period of the apple, and remain upon the wing for several weeks. They are active, run rapidly, and take flight quickly when disturbed. On hot, clear days they may be found on the sunny side of the trunks and larger branches of their host trees, where mating takes place and where the eggs are deposited. The female spends much time running with an intermittent gliding movement over the bark, feeling out places with her ovipositor for laying her eggs. When a suitable crack or opening in the bark is found, she inserts her slender, tube-like ovipositor into the opening and then remains quiet for a few seconds while the egg is being placed. After the egg is disposed

of she moves on in search of other places for ovipositing. It very frequently occurs that one or more females, while engaged in egg laying, will visit a single opening in the bark several times, resulting in a small group of eggs being placed near together (fig. 7). The borers hatching from such groups of eggs feed away from the center in opposite directions, and often eat out a large connected series of burrows.

FIG. 5.—Adult flat-headed apple-tree borer. Enlarged.

THE EGG.

The egg (fig. 7), which is pale yellow in color, is flattened, disk-like, and wrinkled, and is about one-twentieth of an inch in diameter. It is attached firmly to the bark by its flat surface and hatches in from 15 to 20 days. The eggs are usually concealed beneath a scale of bark or within a crack or wound in the bark. A single female probably produces on an average not far from 100 eggs.

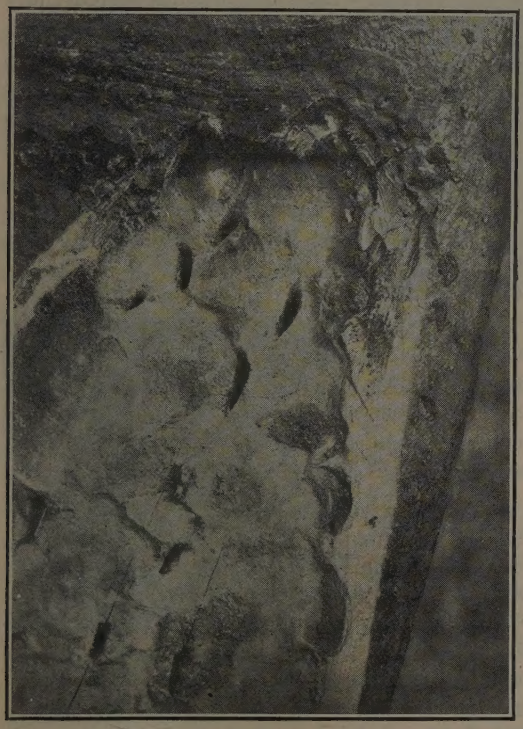

FIG. 6.—Exit holes of flat-headed apple-tree borer beetles in young apple tree.

THE LARVA.

The larva (figs. 1, 4, 8, 9) is a yellowish-white, footless grub, which attains a length of about 1 inch. The three segments of the body next to the head are swollen and flattened, which accounts for the names "flat-head" and "hammer-head," by which the species is commonly known.

The larva is usually found curved like a horseshoe, and is sluggish and inactive except in very warm weather.

FIG. 7.—Eggs of flat-headed apple-tree borer. Enlarged.

On hatching (fig. 8), the larvæ usually enter the bark from directly beneath the egg, and, if the wood is in favorable condition, burrow at once into the inner bark, where they feed on the bark and sapwood and develop rapidly. If, on the other hand, the tree is vigorous and full of sap, the borer is unable to thrive within the growing tissue and may soon die or may live for months just beneath the hard outer layer of bark, where it obtains barely sufficient food to maintain life. Under such conditions the borer sometimes lives for a year or longer, surviving the cold of winter but making scarcely any growth. In time it dies a slow death of starvation unless that part of the tree where it is located should become sufficiently enfeebled for the borer to penetrate to the inner bark undisturbed by the flow of sap. Where such a condition arises the previously starved borer begins at once to grow and develop, but its period of existence in the tree may be lengthened by a year as a result of unfavorable conditions in its early life.

Under favorable conditions the transformation from egg to adult covers a period of one year, but where the development of the larva is retarded by insufficient food, as described above, the period may be lengthened to two years, and possibly longer.

FIG. 8.—Young flat-headed apple-tree borers just leaving the eggs. Enlarged.

It not infrequently occurs that the bark of trees that are but slightly on the decline, or, especially, those that have assumed a leaning position so that the sun's rays fall directly upon the trunk (fig. 3), will contain constantly for years these little, starved, flat-headed borers that are unable to come to maturity. If such trees continue to decline, the time is sure to

come when the borers can penetrate to their favorite feeding place and complete their transformation. After this the injury to the tree is likely to increase rapidly.

Late in the summer the borers that are approaching maturity burrow abruptly into the wood (fig. 10) to a depth of from less than an inch to several inches, and at the end of their slender gallery in the wood construct a flattened pupal chamber in which they pass the winter (fig. 11). After the borer settles in the pupal chamber its color changes to a deeper shade of yellow. In the southern part of its range pupation often takes place within a cell constructed between the bark and wood, adjacent to the feeding galleries.

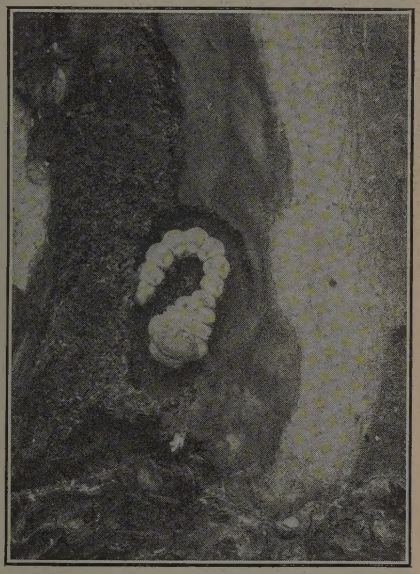

FIG. 9.—Flat-headed apple-tree borer feeding between bark and wood of apple tree.

THE PUPA.

The pupa (fig. 12) averages one-half inch in length and one-fourth inch in width, and resembles in shape and dimensions a small pumpkin seed. When first formed it is yellowish-white, but later its rudimentary eyes, legs, thorax, and other parts of the body take on a metallic brown color. In from three to five weeks it transforms to the adult stage (fig. 5), and the beetles escape from the wood (fig. 6) by means of the entrance galleries of the larvæ.

NATURAL ENEMIES.

The flat-headed apple-tree borer falls a prey to a number of natural enemies which destroy it during its larval, pupal, and adult stages. Woodpeckers devour many of the insects by penetrating to their feeding places in the wood, and the United States Biological Survey has found the beetles in the stomachs of the common crow, kingbird, and red-eyed vireo. Among insects, ants seek out and devour both larvæ and pupæ while they are in the wood, and six hymenopterous parasites are known to attack the species.[1]

[1] *Bracon charus* Riley, *Bracon pectinatus* Say, *Spathius pallidus* Ashm., *Labena apicalis* Cr., *Labena grallator* Say, and *Phasgonophora sulcata* Westw. (fig. 13).

METHODS OF CONTROL.

In the control of the flat-headed borer nothing is more important than such cultural methods as will keep the trees in a normally vigorous and growing condition. Such trees are rarely, if ever, injured. All the well-known orchard practices, such as cultivation, fertilization, spraying, and pruning, have an important effect in lessening the possibilities of injury from flat-headed borers. Such practices tend to keep the trees thrifty and resistant to borer attack.

Trees should be maintained in an upright position, and, where practicable, should be headed low in order to reduce the chances of sun-scald and winter crackling and killing of the bark, both of which invite borer attack. Low-headed trees also have their trunks shaded during the summer, and the sun-loving beetles will not alight upon them to deposit eggs.

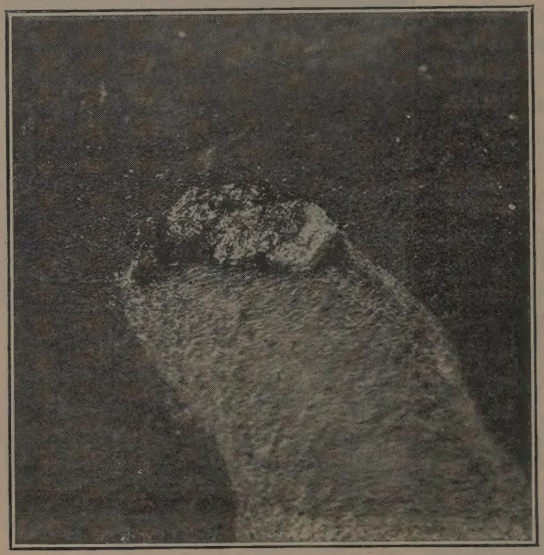

FIG. 10.—Showing where a flat-headed apple-tree borer has entered the wood to pupate at terminus of burrow under the bark. Enlarged.

Eggs may be deposited upon perfectly healthy bark, but the young borers which hatch from eggs so placed are not able to develop, probably for the reason that their burrows, as soon as they extend to the growing tissue, become filled with sap and the borer has to recede or be drowned.

Newly transplanted trees sustain the greatest loss from this insect (fig. 2), because it is impossible to avoid a period of retarded growth following the removal of the trees. After being transplanted, trees should be watched carefully throughout the summer and the borers removed with a knife before they have had time to make deep wounds in the bark and wood. The knife should be used with great care to avoid unnecessary cutting of the bark at a time when the tree is already weakened. An excellent practice where trees are planted near woodlands, or in any position where flat-

headed borers are likely to be numerous, is to shade the trunk of the tree by means of a board driven into the ground on the south side of and close to the tree. The shadow on the trunk repels the female beetles while they are looking for places in which to deposit eggs. Boards 6 inches wide and slightly longer than the trunks of the trees are suitable for this purpose.

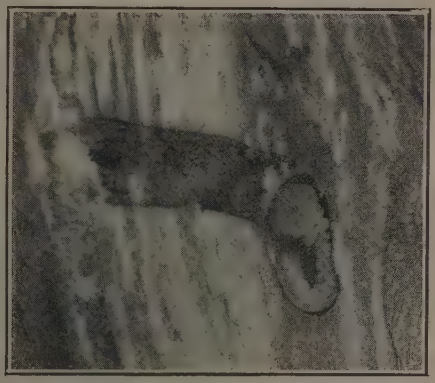

FIG. 11.—Flat-headed apple-tree borer in pupal cell in heart of young apple tree.

The beetles during the period of egg-laying make short and frequent flights to examine all sorts of trees and logs. Through this habit they may be trapped by setting poles post-fashion in the orchard and covering them with some lasting sticky material that will entangle and hold the beetles when they alight. Newly cut logs of almost any size can be made to answer the same purpose by placing them in the orchard and treating the surface with some sticky substance. Oak, hickory, chestnut, willow, or almost any kind of poles or logs may be used, as the beetles do not appear to discriminate before alighting.

FIG. 12.—Pupæ of flat-headed apple-tree borer. Enlarged.

When trunks of trees are injured accidentally by cultivators or other tools the torn fragments of the bark should be pared away and the whole injured surface treated with a heavy coat of white lead paint or some good tree paint. This will prevent borers from entering around the borders and extending the wounded area.

Occasionally the bark of a tree is badly bruised by hail, the injury being followed by flat-headed borer attacks. In such cases, where possible, the trees should be stimulated by cultivation and fertilization to make a quick, strong growth in order to prevent or overcome borer injury. The bruised surface of the trunk and larger branches should also be covered with a coat of paint.

In any case where paint is applied, it is well to see that the coat is in good condition immediately following the blooming period of apple, for it is at about this time that the beetles appear and begin egg laying. Kerosene emulsion, nicotin sulphate solutions, soapy and alkaline washes, and other penetrating caustic and poisonous materials have been applied as sprays and in other ways to infested trees in the hope that enough of the materials would soak through the bark to kill the borers. Such treatments, however, have usually proved disappointing, although in some cases, when applied early in the season, a considerable portion of the very small borers have been destroyed. Burlap or paper wrapped around the trunks of trees will prevent the beetles from ovipositing on the bark. When this method is used, the wrappers should extend from the ground to the branches, and should be tied at the top and mounded with earth at the bottom. The wrappers should be removed at the end of the egg-laying season.

FIG. 13.—Dead and distorted flat-headed apple-tree borers containing the parasite *Phasgonophora sulcata*.

Dying trees and newly cut logs and prunings should never be left standing or lying about the orchard from one season to another. This applies to trap poles and logs used to catch the beetles and to dying wood of fruit and forest trees of almost any kind. Such wood may contain numbers of flat-headed borers that would change to beetles in the spring and deposit eggs within the orchard trees, providing thereby for a new generation of borers. All such wood should be burned during the autumn or winter or in the early spring before the blooming time of apple trees.

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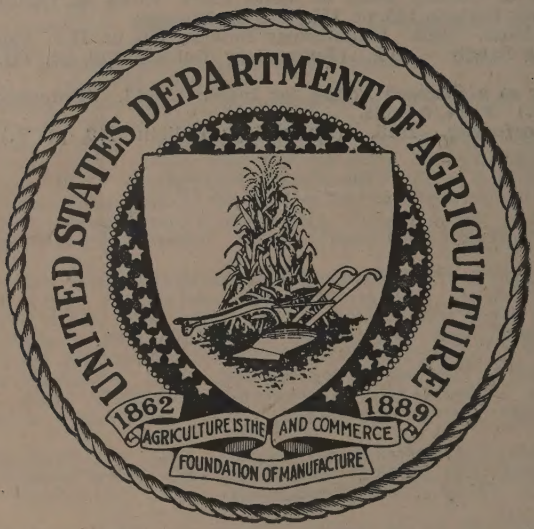

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